European Annals of Otorhinolaryngology, Head and Neck diseases 131 (2014) 93–97

Available online at ScienceDirect www.sciencedirect.com

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Original article

Total laryngectomy or laryngeal preservation for advanced laryngeal cancer. Impact of the functional risk upon the patient's preferences

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ARTICLE INFO

Keywords:
Larynx
Cancer
Laryngeal preservation
Information

ABSTRACT

Objective: To analyse, based on an anonymous questionnaire, the treatment decision envisaged and the impact of the medical information delivered in patients facing the diagnosis of an advanced laryngeal cancer amenable to total laryngectomy or a laryngeal preservation protocol.

Material and methods: Prospective study conducted in a French teaching hospital based on questionnaires filled in by 269 patients attending the otorhinolaryngology clinic.

Results: A total of 28.6% of patients would not consider any trade-off of cure to preserve their larynx; 1.4% of patients were willing to trade all chances of cure in order to avoid total laryngectomy. The median percentage of cure that patients were ready to loose in order to preserve their larynx was 33% (range: 5 to 100%); 47.9% of patients wanted to receive additional information before making their decision with a significant increase among patients with a level of education beyond secondary school ($P = 0.0006$) and among patients with a family history of cancer ($P = 0.038$). The additional information most frequently requested concerned the complications related to the laryngeal preservation protocol (34.1%) and the cure rate (28.6%). After receiving information about the risk of tracheostomy and permanent gastrostomy following the laryngeal preservation protocol, the percentage of subjects who would not consider any trade-off in order to preserve their larynx increased to 31.2% and 56.1%, respectively.

Conclusion: Laryngeal preservation is not a major objective of treatment shared by patients filling a questionnaire devoted to the choice of treatment when facing an advanced laryngeal cancer. Specific information concerning the expected results and the inherent risks involved in the various treatment options must be provided in every case.

1. Introduction

Laryngeal preservation protocols [1–8] and the patient's right to information have developed almost simultaneously in the field of head and neck cancer over the last 20 years in France [9]. Although many studies in the medical literature have assessed the indications, local control rate, survival and risks of tracheostomy and gastrostomy inherent to laryngeal preservation protocols for advanced (stage III–IV) laryngeal cancer [1–8], only two papers [10,11] have specifically analysed the patient's decision when facing an advanced laryngeal cancer amenable to either a total laryngectomy or a laryngeal preservation protocol using chemotherapy and radiotherapy.

This prospective study, based on analysis of questionnaires filled in by patients attending the otorhinolaryngology clinic of a French teaching hospital, completes a preliminary study [11]. It was designed to determine the degree of trade-off in terms of chance of cure that patients would consider in order to preserve their larynx and avoid total laryngectomy. It described the additional information requested by these subjects and analysed the statistical association between the desire to receive additional information and various medical and sociodemographic variables. Finally, it evaluated whether the written information provided concerning the potential risks of tracheostomy and permanent gastrostomy inherent to laryngeal preservation protocols modified the percentage of cure that these subjects would consider to trade in order to preserve their larynx.

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http://dx.doi.org/10.1016/j.anorl.2013.06.001

2. Material and methods

This prospective study was based on the analysis of 269 questionnaires filled in consecutively during the month of June 2010 by patients consulting four senior otorhinolaryngologists (O.L., D.M., M.M. and P.B.) in a French teaching hospital. This population represented a subgroup of the 398 patients who consulted these surgeons during this period: 129 patients were excluded due to refusal to participate in this study (15), failure to answer the questions of the questionnaire (40), ongoing treatment for head and neck cancer (59) or a history of total laryngectomy (15).

The questionnaire approved by our university's ethics committee, validated by the psychiatry department (S.C.), tested on a preliminary panel of 30 patients attending the otorhinolaryngology clinic and composed of four parts, was given to the subjects at the end of their visit.

The first part of the questionnaire provided the subjects with the following information: "The following anonymous questionnaire is given to you in the setting of a study in attempt to evaluate the factors that may influence the decision that a person with a cancer of the larynx (throat) at an advanced stage would take regarding treatment. Please read carefully the following information before answering. We realise that this type of exercise could make you feel uncomfortable, but your opinion would be extremely useful to us.

In France, each year, several thousands of people are affected with advanced laryngeal (the throat) cancer. In the face of such a tumor, two main treatments exist: total laryngectomy and chemoradiation.

Total laryngectomy (complete resection of the larynx) is the treatment that offers the highest cure rate (percentage of chances to be alive without the disease). However, its completion leaves a scar in the neck, loss of respiration by the nose and the mouth, loss of speech and the opening and suture of the trachea to the cervical skin in order to allow for respiration. The risk of death related to this operation is estimated to be less than 1%, a restoration of speech may be achieved in the vast majority of cases. Voice and speech can be subsequently restored (either by learning how to use air present in the oesophagus, called oesophageal speech, or by placing an implant in the neck, called voice prosthesis). The cure rate (percentage of chances to be alive without the disease) after the chemotherapy-radiotherapy treatment is inferior to the one achieved with total laryngectomy. But this treatment option avoids the scar, the loss of speech and the permanent opening in the neck related to the suture of the skin to the trachea."

The second part of the questionnaire, presented in Table 1, collected various medical and sociodemographic data concerning the subjects participating in this study.

In the third part of the questionnaire, subjects were asked to answer the following two questions:

"If you faced an advanced cancer of the larynx, would you considered being treated with a chemotherapy and radiotherapy protocol to avoid total laryngectomy even if this treatment resulted in a reduction of your cure rate (percentage of chances to be alive without the disease). If you answer "Yes", what reduction in the percentage of cure rate would you consider in order to avoid total laryngectomy?"

In the fourth and last part of the questionnaire, subjects were asked to answer the following three questions:

"Would you need more information in order to take your decision and if yes what type of information?

Would you consider to be treated by chemotherapy and radiotherapy (to avoid total laryngectomy) if you were told that this treatment is associated with a 1% risk of requiring a tracheostomy tube (i.e. a prosthesis with an opening in the neck) in order to breathe?

Table 1
Medical and sociodemographic data.

	Patients
Gender: male/female	168/101 (62.5%/37.5%)
Age: median – range (years)	52 – 16 to 88
*Reason for visit to the ENT clinic**	
Otology	67 (24.9%)
Rhinology	123 (45.7%)
Laryngology	44 (16.3%)
Head and neck disease	33 (12.2%)
Benign disease/cancer	233 (86. 6%)/36 (23.4%)
Sociodemographic data	
Single	113/156 (42%/58%)
Dependent minors at home: Yes/No	173/96 (64.4%/35.6%)
Level of education	
Brevet d'études	92 (34.2%)
Baccalaureat	45 (16.7%)
License	38 (14.1%)
Master	39 (14.4%)
Doctorate	55 (20.4%)
Actively employed (Yes/No)◦	151/107 (56.1%/39.7%)
Medical data	
Smoking: Yes/No	73/196 (27.1%/72.9%)
Personal history of cancer: Yes/No	56/213 (20.8%/79.2%)
If yes, head and neck cancer vs non-head and neck	38/18 (67.8%/32.2%)
Family history of cancer: Yes/No	140/269 (52%/48%)
If yes, head and neck cancer vs non-head and neck	11/129 (7.8%/92.2%)

*: missing data for 2 cases; ◦: missing data for 11 cases.

Would you consider to be treated by chemotherapy and radiotherapy (to avoid total laryngectomy) if you were told that this treatment is associated with a 1 to 5% risk of severe swallowing disorders requiring permanent placement (i.e. for life) of a feeding tube in your stomach?"

The data collected, stored on a personal computer, were analysed with Statview software (SAS, Berkeley, USA) in order to: (i) define the percentage of trade in terms of cure rate that patients would consider in order to preserve their larynx, (ii) describe the additional information that subjects would like to receive, (iii) determine whether there was any statistical association between the patients desire to receive additional information and the medical and sociodemographic variables collected (Table 1) and (iv) analyse the impact of written information concerning the potential risks of tracheostomy and/or permanent gastrostomy after chemoradiation on the percentage of cure that patients would consider to trade in order to preserve their larynx. The Chi^2 and Fisher *t*-tests, the nonparametric Mann-Whitney U test and the linear regression method were used for analysis. Statistical significance was set at a *P* level of 0.05.

3. Results

A total of 28.6% (77/269) of patients would not consider any trade of cure in order to preserve their larynx; 1.4% (4/269) of patients were willing to trade all chances of cure in order to avoid total laryngectomy. The median percentage survival that the subjects would consider to trade in order to preserve their larynx was 33% (range: 5 to 100%) (Fig. 1).

In all, 47.9% (129/269) of patients wanted to receive additional information before making their decision. On univariate analysis (Table 2), two variables were statistically related to the percentage of patients willing to receive additional information. This percentage was significantly higher when the patient's level of education exceeded secondary school ($P = 0.006$) and in patients with a family

Table 2
Univariate analysis of variables affecting the desire to receive or not receive additional information.

	Requests additional information	Does not request additional information	*P*
Gender: male vs female	80/49	88/52	0.9
Age (years): median – range	51 – 16 to 88	55 – 21 to 84	0.064
*Reason for visit at the ENT clinic**			
O/R/L/H&N	34/59/19/16	33/64/24/17	0.4
Benign disease/cancer	114/15	19/21	0.4
Sociodemographic data			
Single: Yes/No	57/72	56/84	0.5
Dependent minors at home: Yes/No	80/49	93/47	0.5
Level of education: BEPC/Bac/L/M/D	34/14/22/25:34	58/31/16/14/21	**0.0006**
Actively employed: Yes/No	78/48	73/59	0.3
Medical data			
Smoking: Yes/No	36/93	37/103	0.7
If yes: cigarettes/day: median – range	10 – 1 to 50	15 – 2 to 45	0.1
Personal history of cancer: Yes/No	25/104	32/108	0.5
If yes, head and neck cancer vs non-head and neck	9/16	19/13	0.1
Family history of cancer: Yes/No	76/53	64/75	**0.038**
If yes, head and neck cancer vs non-head and neck	6/70	6/58	0.7

O: otology; R: rhinology; L: laryngology; H&N: head and neck disease; Bac: baccalaureat; L: license; M: Master; D: Doctorate; *n*: number.
Bold is used to increase visualisation of the significant results.

history of cancer ($P = 0.038$), although the type of cancer (head and neck or non-head and neck) had no impact.

The additional information most frequently requested by patients (Table 3) concerned complications, adverse effects and/or risks related to the laryngeal preservation protocol (34.1%) and the cure rates (28.6%). In contrast (Table 3), the surgical team's opinion (5.4%), another specialist's opinion (5.4%), the general practitioner's opinion (1.5%), the fact of not being able to take this decision (2.3%), the need for more time to think about the decision (1.5%), the need to be reassured (0.7%), the duration of treatment (0.7%) and/or tracheostomy management (2.5%) were only very rarely spontaneously reported by subjects requesting additional information. The possibility of salvage therapy in the case of failure of laryngeal preservation (7.7%), the desire to meet with a laryngectomized patient (8.5%) and the simple desire for more information without specifying the type of additional information (12.4%) were situated between these extreme values (Table 3).

After reading the written information provided on the respective percentage risks associated with tracheostomy and permanent gastrostomy after a laryngeal preservation protocol, 31.2% (84/269) and 56.1% (151/269) of patients, respectively, finally decided that they would not trade off the slightest chance of survival in order to preserve their larynx.

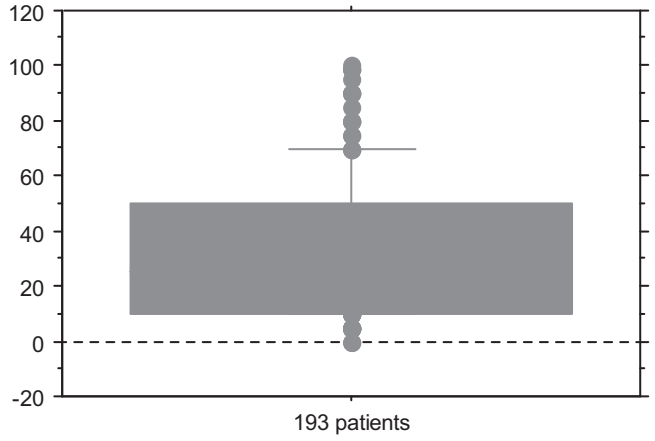

Fig. 1. Distribution (box and whisker plot) of the percentage chance of cure that subjects would consider to trade off in order to preserve their larynx.

Table 3
Additional information requested by 129 subjects.

Additional information requested	% (*n*)
Cure rate of the two treatment options	28.6 (37)
Duration of treatment	7.7 (10)
Degree of extension of the disease	2.3 (3)
Quality of life after treatment	0.7 (1)
Time until treatment	0.7 (1)
Life expectancy after treatment according to age	0.7 (1)
Complications, adverse effects and/or risks of preservation	34.1 (44)
Possibility of salvage in the case of failure of preservation	9.3 (12)
Meet with a laryngectomized patient	8.5 (11)
Rehabilitation and quality of speech after total laryngectomy	6.2 (8)
Other risks of total laryngectomy	2.3 (3)
Tracheostomy management after total laryngectomy	1.5 (2)
Quality of eating	1.5 (2)
Pain management	0.7 (1)
Surgeon's or attending team's opinion	5.4 (7)
Other specialist opinion	5.4 (7)
General practitioner's opinion	1.5 (2)
Requests more information, but cannot specify what information	12.4 (16)
Claims that he/she is unable to decide	2.3 (3)
Requests time to think about the decision	1.5 (2)
Palliative care	1.5 (2)
Wants to be reassured	0.7 (1)
Possibilities of euthanasia	0.7 (1)

n: number.

4. Discussion

The French Law dated 4 March 2002, called "Patients' rights and quality of the health system" established that patients should participate in medical decisions concerning them and that this participation was based on obtaining "free and informed consent" after receiving "honest, clear and appropriate information" [6]. This law also requires the doctor to inform the patient about "the various treatment options, their value, their possible degree of

urgency, their consequences, the normally predictable frequent or serious risks and the predictable consequences in the case of refusal of treatment" [6]. This law is especially applicable to advanced (stage III–IV) laryngeal cancer, as chemotherapy and radiotherapy laryngeal preservation protocols as an alternative to the conventional treatment option, total laryngectomy, have been developed over the last 20 years.

Laryngeal preservation protocols, validated by the American Society of Clinical Oncology [5], are designed to preserve speech, breathing and swallowing functions of the larynx without altering survival. However, the long-term results (presented orally [4] but unfortunately not yet published) of the first [1] prospective study on this subject revealed a high rate (34%) of "unexplained" deaths after chemoradiation, raising the question of the long-term toxicity of these protocols. Analysis of the US National Cancer Data Base concerning laryngeal cancer, conducted by Hoffman et al. in 2006 [12], demonstrated a reduction of the 5-year survival in the group of patients treated with chemoradiation compared to the group treated by surgery.

Patients with advanced (stage III–IV) laryngeal cancer are therefore faced with a therapeutic dilemma requiring a trade-off between preservation of laryngeal function offered by the laryngeal preservation protocol or the better survival provided by total laryngectomy. This classical "trade-off" situation does not only apply to advanced laryngeal cancer, but also concerns all fields of oncology. The most highly publicized examples are prostate cancer in men: chemoradiation that preserves erectile function versus prostatectomy, and breast cancer in women: chemoradiation versus mastectomy.

Although several studies in the context of advanced laryngeal cancer have emphasized the clinical (early T stage, N0 status, absence of cartilage invasion of the pre-epiglottic compartment and/or extralaryngeal extension), biological (p53 protein expression) or therapeutic factors (major clinical response to induction chemotherapy) that can encourage the clinician to propose a laryngeal preservation protocol, only very few studies have presented this analysis from the patient's point of view.

The first study published on this topic in the *New England Journal of Medicine* in 1981 by McNeil et al. [10] noted that most North American subjects (12 fire-fighters and 25 executives in good health) placed in a situation of stage T3 laryngeal cancer were willing to trade off 15 to 30% of their life expectancy in order to preserve their larynx. More recently, in a cohort of 309 patients attending the otorhinolaryngology clinic of a French teaching hospital for various diseases, asked to imagine that they suffered from advanced laryngeal cancer, we demonstrated that, although 64.5% of subjects of this cohort would consider a reduction of their survival in order to preserve their larynx, 12.9% were unable to take this decision and 24.6% were not prepared to accept the slightest reduction of their chance of survival even at the cost of total laryngectomy [11]. Although four variables in this study (age, level of education, occupation and family history of cancer) affected the subject's capacity to take a decision, none of these factors was able to predict which subjects would accept a trade-off of their chances of survival to preserve their larynx or the percentage survival they were willing to trade off to preserve their larynx [11]. The present study completes the findings of this preliminary study. Analysis of the questionnaires revealed that 28.6% of subjects would not consider the slightest trade-off of survival to preserve their larynx and that subjects willing to trade off survival to preserve their larynx reported a very wide range of acceptable percentage trade-off (Fig. 1), ranging from 5 to 100% with a median of 33%. Furthermore, almost one half (47.9%) of subjects wanted to receive additional information before taking their decision with a statistically significant increase in this percentage among subjects with a level of education beyond secondary school ($P = 0.0006$) and among subjects with a family history of cancer ($P = 0.038$). The additional information most frequently requested (Table 3) concerned complications, adverse effects and/or risks related to the laryngeal preservation protocol and the expected cure rates. Finally, after receiving information on the risk of tracheostomy and permanent gastrostomy after laryngeal preservation protocol, the percentage of subjects who would no longer consider the slightest trade-off in terms of survival to preserve their larynx increased to 31.2% and 56.1%, respectively.

These findings raise a number of comments. The first comment concerns the fact that this study was based on analysis of responses from patients not presenting the disease studied (advanced laryngeal cancer), but simply asked to imagine being faced with this type of disease. This factor could be considered to constitute a major bias that would limit all of the proposed conclusions of this study. However, we do not believe that this aspect constitutes a major bias, as a very small percentage (2.3%, Table 3) of subjects in our study considered that they were unable to answer the questions raised concerning the treatment options analysed in this study. Furthermore, the previous study conducted on the same population [11] also emphasized the absence of modifications in terms of the percentage of subjects that would consider to trade off a percentage chance of cure in order to preserve their larynx when comparing patients who were or not yet treated for another head and neck cancer. The second comment concerns the similarity of the figures published in 1981 in the study conducted in the same field by a North American team [10] and our results, suggesting that there is no major difference between the points of view of American and European patients with respect to the trade-off between cure and laryngeal preservation that they would consider if they faced an advanced laryngeal cancer. The third comment concerns the high percentage of subjects (28.6%) who would not consider the slightest reduction of their chance of cure, even at the cost of total laryngectomy (while only 1.4% of subjects were willing to lose all chances of cure in order to avoid total laryngectomy) and the fact that this percentage increased to 31.2% and 56.1%, respectively, after subjects had been informed about the risk of tracheostomy and permanent gastrostomy after a laryngeal preservation protocol. All of these figures suggest that total laryngectomy is a treatment option that should be discussed in detail with patients with advanced laryngeal cancer. Survival figures can have a major impact on the patient's decision to accept or refuse total laryngectomy in this setting. For instance, in the study by McNeil et al. [12], none of the subjects included would have considered radiotherapy as a treatment option if the 3-year survival after this option was only 30%, while 43% of subjects would have considered this treatment option as an alternative to total laryngectomy if the 3-year survival was 40%. This impact of survival rate on the potential decision of an organ preservation protocol in patients with advanced laryngeal cancer should encourage head and neck cancer surgeons to be very familiar with quantitative survival data and to publish the results of clinical trials analysing survival not as a function of stage (III or IV) alone, but also as a function of the various known risk factors, particularly clinical (anatomical site, T and N classification, cartilage invasion, invasion of the pre-epiglottic compartment, extralaryngeal extension) with a potential impact on survival. Finally, our last comment concerns the fact that, although many subjects requested additional information, very few of them spontaneously considered seeking additional information from another specialist (5.4%) or their general practitioner (1.5%), requested a period of reflection before making their decision (1.5%) and/or considered that they needed to be reassured (0.7%). In our country, it therefore appears that, although a detailed information about the disease and the results and risks

inherent to the various treatment options must be provided to our patients, they do not (yet?) express the desire to seek other opinions.

5. Conclusion

This prospective study based on analysis of the point of view of otorhinolaryngology patients set in a situation to face the diagnosis of an advanced laryngeal cancer reveals that: (i) laryngeal preservation is not a primary objective shared by all subjects; (ii) the percentage chance of cure that subjects would be willing to trade off to avoid total laryngectomy is extremely variable and (iii) the information on the major functional risks inherent to laryngeal preservation protocols has a major impact on the subject's treatment decision. These elements, combined with a strong desire for more detailed information, particularly on cure rates and complications, must be taken into account by clinicians, especially as a recent Court of Cassation decision (decision No. 09-13.591 dated 3 June 2010) now considers the failure to provide adequate information as a legal fault that generates specific moral damage that may be subject to compensation, even when no damage arises from the procedure incriminated and/or when it can be shown that adequate information would not have led the patient to chose another option. Under these conditions, the neoadjuvant chemotherapy treatment option can be particularly useful, as the clinical response obtained can be used to optimally guide the final treatment decision (chemoradiation in good responders and total laryngectomy in non-responders), while the duration of this first-line treatment gives both the surgeon and the patient time to share good quality information before deciding on the most appropriate final treatment option.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

Acknowledgements

The authors would like to thank the Progrès 2000 association for its technical support of this study.

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